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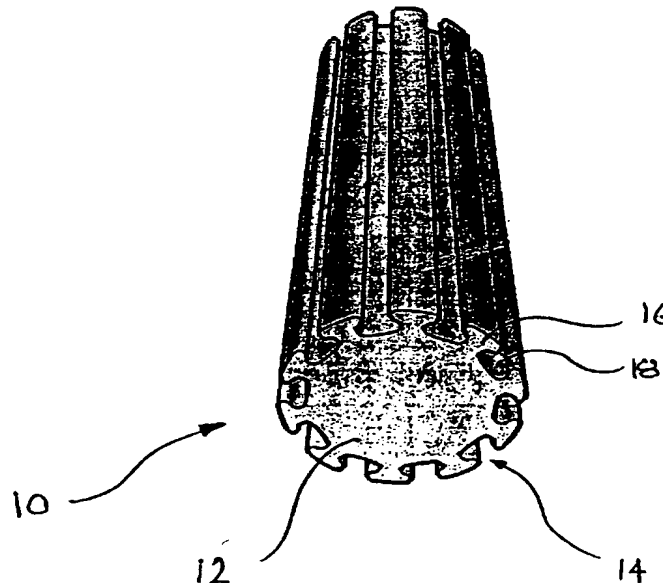
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(54) Title: CONDUCTOR MEMBERS



(57) Abstract: The present invention relates broadly to a flexible and elongate conductor member (10) including an insulating and protective sheath (12) formed about a conductive core (not designated). The protective sheath (12) has an exposed surface (14) including engaging means in the form of a plurality of protrusions or flutes (16) separated by a plurality of recesses or elongated channels (18). The flutes and channels (16) and (18) are in cross-section shaped substantially complementary to one another and can interlock or interengage with one another. In operation the conductor member or cable (10) can on contact with itself or another conductor member releasably attach or interengage to inhibit relative movement and the likelihood of the conductor tangling or knotting.

CONDUCTOR MEMBERS

FIELD OF THE INVENTION

The present invention relates broadly to a flexible and elongate conductor member and relates particularly, though not exclusively, to a conductor member such as an electrical
5 cable or wire.

BACKGROUND OF THE INVENTION

Cords, ropes, cables, strings, wires and leads are used in many day to day applications. Because of the length and flexible nature of these devices, tangling and knotting is a frequent occurrence which can affect their functionality and/or longevity. One example which
10 illustrates the problems often encountered is with electrical wires or leads extending from earpieces used in conjunction with mobile phones or portable music players. Quite often when the ear piece is not in use, it is left in a pocket or bag where it invariably tangles and forms knots providing a nuisance for the user of the device and also affecting the performance of the wires. Another example is shown with electrical, audio and data leads
15 extending from appliances such as home stereo equipment and computer equipment. In such cases, many components with individual power needs are often grouped together requiring a number of electrical leads leading from each unit, together with audio, and data signal carrying leads or wires. This results in a mass of leads and wires which quite often get tangled, making dismantling and reconnecting of the different components quite difficult. A
20 further example of such problems is demonstrated with the electrical cords of household appliances and in particular appliances that are frequently used and then stored away, such as in the case of clothes irons and sandwich makers. For these appliances, it is not uncommon for the electrical cord to get tangled or kinked whilst the appliance is stored.

Many existing methods of preventing tangles and/or knots from forming in cables, leads
25 and wires involve specialised devices controlling their stowage and deployment. These devices add considerable cost and bulk to the applications these leads are used for. Other methods of preventing tangles and knots involve the cables or wires themselves being constructed such that they naturally spring into a coiled or non-extended position. This approach adds considerable cost to the production of the cables or wires and provides that
30 their overall size is substantially increased in bulk. Another approach involves the cables or

wires being organised into conduits. However, this is not suitable where the members need to be frequently deployed and stowed such as for use with mobile devices.

United States patent no. 6,111,202 discloses a dual conductor electrical cable of a ribbon-like construction and having a protrusion and a matching depression on respective opposing
5 surfaces. The cable is specifically designed to be coiled with the protrusion nesting within the depression in this coiled configuration. The protrusion and mating depression of the cable of this US patent may alternatively be formed to include a barb or detent designed to intimately retain adjacent coils of the cable in mated contact. The cable is nested in this
10 coiled configuration with the protrusion accurately aligned with the mating depression along its entire length and the cable mates with itself in one rotational position only.

SUMMARY OF THE INVENTION

According to one aspect of the present invention there is provided a flexible and elongate conductor member including an exposed surface having engaging means being adapted in a plurality of rotational orientations and on contact with the conductor member or another
15 object to inhibit relative movement between contacting portions of the conductor member, or contacting portions of the conductor member and the object.

Preferably the engaging means provides releaseable and interlocking engagement between the contacting portions. More preferably the engaging means includes a plurality of protrusions being separated by a plurality of recesses, at least one of the protrusions being
20 capable of interlocking with at least one of the recesses to prevent movement between these contacting portions. Alternately the engaging means includes one element having a series of hooks and an adjacent or other element having a series of loops, the hooked element capable of interlocking with the looped element to inhibit movement between these contacting portions.

25 Alternately the engaging means provides a releaseable bond between the contacting portions. Preferably the engaging means includes an adhesive applied to or forming part of the exposed surface and being capable of releaseably adhering to the conductor member or the other object to prevent relative movement therebetween.

According to another aspect of the invention there is provided a conductor tie being elongate
30 and at or adjacent opposite ends designed to engage itself and at least one of a plurality of

the conductor members according to the preceding aspect of the invention, said members being encircled by the conductor tie.

Preferably the conductor tie is in the form of a flexible strip on each of its opposing surfaces having a plurality of protrusions separated by a plurality of recesses, one or more of the
5 protrusions on one of the opposing surfaces being designed to releasably engage one or more of the recesses on an opposite of said surfaces. More preferably the protrusion/recesses of the conductor tie are of a substantial identical cross-sectional shape to those of the conductor members to permit interengagement of the conductor tie and said members.

Preferably the protrusions and recesses of the engaging means include respective flutes and
10 elongate channels each being arranged generally parallel to one another and coaxial with the conductor member. More preferably the protrusions and recesses are in cross section at least in part shaped complementary to one another to assist with their releaseable and interlocking engagement. Even more preferably the flutes and channels are circumferentially spaced and occupy substantially the entire circumference of the elongate
15 member.

Preferably the flutes and channels are at least in part cross section tapered, flared or bulged outward to provide releaseable keyed engagement with each other. More preferably the flutes are constructed of a resiliently flexible material to provide at least partial press fitting of the flute within the interengaging channel.

20 Preferably the conductor member is contacted with itself whereby the engaging means reduce the likelihood of said member tangling or knotting with itself. Alternately the other object is one or more other conductor members of the invention whereby contact and interengagement of the engaging means of said members at least lessens the likelihood of tangles or knots.

25 Alternately the other object is an attachment device including an exposed surface having other engaging means being adapted to contact the engaging means of the elongate conductor member for releaseable attachment of said conductor member to the attachment device. Preferably the other engaging means is at least in part shaped in cross section complementary to the engaging means of the conductor. More preferably the attachment
30 device is adapted to be fixed or otherwise mounted to a building structure or furniture.

Preferably the flexible and elongate conductor member is in the form of an electrical cable or wire, or acoustical lead or wire.

BRIEF DESCRIPTION OF THE DRAWINGS

5 In order to achieve a better understanding of the nature of the present invention several preferred embodiments of a flexible and elongate conductor member will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a conductor member according to an embodiment of the invention;

Figure 2 is a cross-sectional view of the conductor member of figure 1;

10 Figure 3 is a cross-sectional and enlarged cross-sectional view of adjacent and interengaging conductor members of another embodiment of the invention;

Figure 4 is a perspective view of a further embodiment of a conductor member of the invention;

15 Figure 5 is a perspective view of yet another embodiment of a pair of interengaging conductor members of the invention;

Figure 6 is a perspective view of yet a further embodiment of a pair of interengaging conductor members of the invention;

Figure 7 is a schematic view of three (3) interengaged conductor members such as those of any one of figures 1 to 6;

20 Figure 8 is a schematic representation of a stereo headset including conductor members such as those depicted in any one of figures 1 to 6;

Figure 9 is a schematic view of a coiled conductor member such as that illustrated in any one of figures 1 to 6;

25 Figure 10 is a perspective view of the conductor member of figure 7 in application on a typical household appliance;

Figure 11 is a schematic illustration together with an enlarged view of another embodiment of a conductor member according to the invention;

Figure 12 is a schematic view together with an enlarged view of yet another embodiment of a conductor member according to the invention;

- 5 Figure 13 is a schematic illustration and an enlarged view of yet a further embodiment of a conductor member according to the invention;

Figure 14 is a schematic illustration and an enlarged view of still another embodiment of a conductor member according to the invention;

- 10 Figure 15 is a schematic representation of the conductor member of any one of the embodiments of figures 11 to 14 interengaging itself;

Figure 16 is a schematic representation of a pair of conductor members such as those illustrated in any one of figures 11 to 14 interengaging each other;

Figure 17 is a cross-sectional view of a pair of conductor members of still a further embodiment of the invention shown in engagement with another object;

- 15 Figure 18 is a schematic view of a further example of a conductor member interengaging with another object in the form of an attachment device mounted to furniture;

Figure 19 is a schematic representation of yet a further embodiment of a conductor member interengaged with the attachment device such as those of figures 17 and 18 mounted to a building structure; and

- 20 Figure 20 is a cross-sectional view of a plurality of the conductor members such as that shown in figures 1 and 2 arranged in a bundle and encircled by a conductor tie according to another aspect of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- 25 As shown in figures 1 and 2 there is an embodiment of a flexible and elongate conductor member 10. The conductor member 10 is in this example an electrical conductor member in the form of an electrical cable but for ease of reference is not illustrated with its conductive core. The electrical cable 10 includes an insulating and protective sheath 12 formed about the

core (not shown) and including an exposed surface designated generally as 14 having engaging means.

The engaging means of the preferred embodiment of figures 1 and 2 includes a plurality of protrusions or flutes 16 separated by a plurality of recesses or elongated channels 18. The
5 flutes and channels 16 and 18 of this example are in cross-section shaped substantially complementary to one another. The flutes 16 and channels 18 are arranged parallel to one another and coaxial with the electrical cable 10 with the flutes/channels 16/18 being equally spaced circumferentially about the exposed surface 14. The flutes 16 and channels 18 are
10 bulged outwardly and inwardly, respectively, and in cross-section are generally crown-shaped with inwardly tapered opposing walls such as 20 and 22 (see Figure 2).

Figure 3 illustrates a variant of the electrical cable 10 of figure 1. For ease of reference and understanding, like components for the electrical cable of figure 3 have been designated with the same reference numerals as the corresponding component of the cable 10 of figures 1 and 2. The electrical cable 10 of this variant is most typically a power cable including three (3)
15 coaxial conductors including earth 24, neutral 26 and active 28 conductors. These conductors 24/26/28 are housed within a cylindrical jacket 30 about which the outer protective sheath 12 is formed.

The sheath 12 includes a plurality of the flutes 16 separated by the channels 18 and equally spaced circumferentially about the electrical cable 10. As best shown in the enlarged
20 representation of figure 3, the flutes such as 16A and 16B are generally dome-shaped including opposing barbed portions such as 32 and 34 designed to engage or interlock with the respective channels 18A and 18B. In this example the outer sheath 12 is formed of a resiliently flexible material which permits press fitting of the flute such as 16A into the corresponding recess such as 18A.

25 It should be appreciated that the electrical cable 10 of figures 1 and 2 can in a similar manner to the cable of figure 3 be interengaged or interlocked. In both examples this interengagement serves to inhibit relative movement between contacting portions of the conductor member in the form of the electrical cable 10. In particular, the contacting portions of the embodiment of figure 3 is generally defined by the interlocking flutes 16A/B
30 and channels 18A/B which provide releasable attachment of the electrical cable 10. It has been found that this form of releasable engagement or attachment reduces the propensity for

the cable 10 to tangle or knot with itself or another cable. This can be contrasted with conventional electrical conductors such as cables or wires which can readily slide when in contact with one another and this is understood to lead to tangling or knotting of these traditional or conventional cables.

5 Figure 4 illustrates another embodiment of a flexible and elongate conductor member according to the invention. This embodiment is typically of a dual conductor configuration including a pair of spaced apart conductors (not shown) contained within the protective sheath 12. The dual conductor cable 10 is in cross-section substantially elliptical including engaging means on opposing of its generally flat exposed surface portions 15A and 15B. The
10 engaging means in this embodiment is in the form of a series of adjacent and generally parallel protrusions or flutes such as 16A/B and recesses or channels such as 18A/B. The flutes/channels such as 16A/18A are, in a similar manner to the embodiment of figure 3, designed to interengage with themselves or corresponding flutes/channels of another dual conductor cable to inhibit relative movement and the likelihood of the cable(s) tangling or
15 knotting.

Figures 5 and 6 illustrate further embodiments of a conductor member designed specifically to interengage with a corresponding conductor member to inhibit relative movement and their propensity to knot or tangle. The conductor member 10 of figure 5 includes three (3) upper flutes 16A to 16C and two (2) lower flutes 16D and 16E formed on opposing exposed
20 surfaces of an intermediate sheath 12. Although not illustrated, the intermediate sheath 12 includes one or more conductors. The flutes 16A to 16E are arranged parallel to one another and spaced by intermediate recesses or channels such as 18A to 18C which are in cross-section shaped complementary to the flutes such as 16A. In the embodiment of figure 5 the lower pair of flutes 16D and 16E of the conductor 10 interengage with corresponding
25 recesses or channels 18A' and 18B' of the or another conductor member 10'. The conductor members 10 and 10' of figure 6 similarly interengage or mate with one another wherein the protrusion or flute 16A is press fit within a corresponding recess or channel 18A' of the other conductor member 10'. The flutes and channels such as 16A/18A of the embodiment of figure 6 are in cross-section shaped substantially circular and the flutes such as 16A and 16B
30 house respective conductors such as 25A and 25B.

Figure 7 schematically illustrates three (3) of the conductor members 10A, 10B and 10C bundled together and interengaging with each other with a reduced likelihood of tangling or

knotting of these electrical cables. The electrical cables 10A to 10C may be constructed in accordance with any one of the embodiments of figures 1 to 6. It is important to note that the cables such as 10A and 10B can be bundled and interengage with one another in a plurality or in this example multiplicity of orientations where one of the cables such as 10B may be twisted or rotated along its length. In this example, the electrical cable 10B can take a multiplicity of rotational orientations and still interengage with an adjacent of the cables such as 10A. In this example the flutes 16 may engage with a corresponding channel 18 for a short length, and then be twisted and interlock with another channel (not designated) of the contacting conductor such as 10C. It should be appreciated that interengagement of the electrical cables such as 10A to 10C is relatively random and does not rely upon precise alignment of for example the corresponding flutes/channels.

Figure 8 is a stereo headset 35 including an audio device 36 connected to an intermediate lug 37 via a coaxial cable or lead 38. The lead 38 is separated above the lug 37 into a pair of earphone leads 39A and 39B which connect to respective earphones 41A and 41B. The earphone leads 39A/B are each constructed from a conductor member of an embodiment of the invention such as that illustrated in any one of figures 1 to 6. The earphone leads 39A/B can conveniently be bundled together wherein they attach to each other for stowage with a reduced propensity for tangling. During operation, the earphone leads 39A/B are separated to allow the earphones 41A/B to be inserted in the ears for listening.

Figures 9 and 10 show interengagement of one of the conductor members 10 of figures 1 to 6 in a coiled arrangement such as 40. The electrical conductor 10 interengages itself randomly along its length at contacting locations where corresponding flutes/channels 16/18 align. This relatively random interengagement of the cable 10 with itself has been found to reduce the propensity for tangling or knotting. Figure 10 shows a typical application for the coiled arrangement 40 of the cable 10 where it is a power supply for a domestic appliance such as an iron 42.

Figures 11 to 14 illustrate alternate embodiments of flexible and elongated conductor members according to the invention. Each of these embodiments includes different forms of engaging means located on an exposed surface of the conductor member and designed on contact with the conduct member itself or another object to inhibit relative movement between these contacting portions. As described in the context of the earlier embodiments of

figures 1 to 6, this interengagement of the conductor member with itself or another element reduces the likelihood of tangling or knotting of the conductor member.

Figure 11 shows one form of the engagement means including a pair of opposing strips 60 and 62 adhered or otherwise fixed to respective opposing semi-circular surfaces of a cable or wire (not designated). One of the strips 60 includes a series of hooks such as 64 whereas the other strip 62 includes a series of loops (not shown or designated) each being embodied in the form of VELCRO. The hooks such as 64 and loops may alternately be formed integral with an exposed surface or outer protective sheath of the cable 10. The hooked or looped strips 60 and 62 may also be positioned alongside one another and wrapped around the inner cable 10 in the form of a helix.

Figure 12 is a variation of the engaging means of figure 10 and includes an array of rectilinear blocks such as 66 extending from an exposed surface of a protective sheath of the conductor member 10. The blocks such as 66 are separated by recesses or voids such as 68 or a similar width to the blocks 66 themselves. The blocks such as 66 are made of a resiliently flexible or soft material which provides interengagement or releasable interlocking of blocks such as 66 with voids such as 68 at contacting portions of the conductor member 10.

The embodiment of figure 13 is in the form of a generally flat conductor member 10 having engaging means in the form of a stepped profile 70 formed along its opposing edges. The stepped profile 70 includes alternate notches 72 and ridges 74 extending alongside one another and the opposing edges of the conductor member 10. It will be appreciated that the complementary-shaped notches 72 and ridges 74 when contacting or interengaging with one another inhibit relative movement and as such reduce the propensity for knots or tangles.

Figure 14 schematically illustrates another form of the engaging means including adhesive strips such as 76 located about an exposed surface of the conductor member 10. The adhesive strip 76 is in this example formed as a helix about the conductor member 10 which may be coated in two different adhesive substances. It will be appreciated that contact of the adhesive strip such as 76 with the conductor member itself or other conducted members forms a temporary bond between said members which restricts their relative movement and reduces the likelihood of tangles or knots.

Figure 15 is a schematic representation of the conductor member 10 of any one of the embodiments of figures 11 to 14 in contact with itself to inhibit relative movement and thus

reduce the likelihood of tangles. The schematic of figure 16 shows a pair of conductor members 10 and 10' such as those described and illustrated in figures 10 to 13 in contact with one another in such a manner as to restrict or inhibit relative movement and lessen the likelihood of tangles. It should be appreciated that in either of these applications the conductor member or cables such as 10 can be contacted in a multiplicity of positions which provide interengagement and inhibit relative movement. The cables 10 can preferably be randomly coiled or bundled with contact and interengagement at a plurality of random points. This random interengagement limits relative movement between the cable(s) and reduces their propensity for tangling or knotting.

- 10 Figure 16 illustrates a pair of conductor members 10A and 10B similar to that of figures 1 and 2 in releaseable engagement with an object in the form of an attachment device 80. The attachment device 80 is in the form of an elongate strip including a plurality of longitudinally extending and transversely spaced apart flutes 82 and elongate channels 84. The flutes/channels 82/84 are in cross-section shape complementary to the flutes/channels 15 16/18 of the conductor members 10A/B. The conductor members such as 10A are thus designed to releaseably attach to the attachment device 80 by press fitting of one or more of the member flutes such as 16B into a corresponding recess such as 84B of the attachment device 80. The attachment device or strip 80 includes one or more fixing holes 88 designed to receive respective fasteners such as 90 for mounting of the attachment strip 80 to a building 20 structure or furniture.

Figure 17 shows the attachment device or strip 80 secured to a desk 92 of in this example a computer workstation. The attachment strip 80 provides temporary or releaseable attachment of the conductor member 10 of for example figures 1 or 16. Figure 18 shows a variant of this application where the attachment device or strip 80 is secured to a skirting 25 board such as 94. The conductor member 10 can be temporarily attached to the attachment strip 80 by interengagement with in this example the flutes such as 16 and channels such as 84 of the conductor member 10 and the attachment strip 80, respectively. The conductor member or electrical cable 10 can engage with the attachment device 80 in a multiplicity of positions or orientations.

- 30 Figure 19 shows a bundle of conductor members 10 such as that illustrated in figures 1 and 2 together with a conventional cable 96 or the like. The conductor members or electrical cable 10 of the preceding aspect of the invention are in this embodiment interlocked at a plurality

of random contacting locations. The bundle of cables 10 and 96 are encircled by a conductor tie 98. The conductor tie 98 of this embodiment is in the form of a flexible strip having a plurality of protrusions such as 99 separated by a plurality of recesses such as 100. The protrusions/recesses 99/100 are of a similar profile shape to the flutes/channels 16/18 of the conductor member 10. One or more of the protrusions such as 99 on one surface of the conductor tie 98 are designed to releasably engage or interlock with one or more corresponding recesses such as 100 of an opposite surface of the cable tie 98. Furthermore, flutes 16 of the conductor members such as 10 randomly engage corresponding recesses such as 102 of an inner facing surface of the cable tie 98. The conductor or cable tie 98 therefore provides additional securing of the conductor members 10.

Although the conductor member has solely been described in the context of an electrical cable or wire it may also have application in data communication or acoustics. The conductor member may have application for use with mobile phone and music player, microphones/earpiece leads which are frequently stowed and deployed. The conductor member may also be used for cables or leads of mobile device power supplies and battery charges since these are also frequently stowed and deployed.

Now that several preferred embodiments of the present invention have been described in some detail it will be apparent to those skilled in the art that the conductor member has the following advantages over the admitted prior art:

1. the conductor member can interengage with itself or other conductor members in a generally random manner wherein the conductor member is oriented in a multiplicity of positions;
2. the conductor member provides an effective means of at least reducing the propensity for electrical cables or wires or the like from tangling or knotting;
3. the conductor member and attachment device provide an effective means for securing electrical cables or wires to a building structure or furniture;
4. the conductor member can be integrated with conventional protective sheaths or the like for electrical cables or wires; and

5. the conductor member in its preferred form is self attaching and can be coiled or bunched without the need for tying off thereby further reducing the likelihood of tangling; and

5 6. the conductor member can preferably be bundled with other conductor members with which it interengages or attaches without the need for ties or conduits to keep the conductor members together.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. For example, the profiles of the interlocking mechanical engaging means described may vary provided
10 relative movement is inhibited between contacting portions of the conductor member. However, conductor members of a consistent cross section along their length are preferred from a manufacturing point of view wherein they can be extruded. All such variations and modifications are to be considered within the scope of the present invention the nature of which is to be determined from the foregoing description.

15 All publications mentioned in this specification are herein incorporated by reference. Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a context for the present invention. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present
20 invention as it existed anywhere before the priority date of each claim of this application.

13.

CLAIMS

1. A flexible and elongate conductor member including an exposed surface having engaging means being adapted in a plurality of orientations and on contact with the conductor member or another object to inhibit relative movement between contacting portions of the conductor member, or contacting portions of the conductor member and the object.
5
2. A conductor member as defined in claim 1 wherein the engaging means provides releaseable and interlocking engagement between the contacting portions.
3. A conductor member as defined in claim 2 wherein the engaging means includes a plurality of protrusions being separated by a plurality of recesses, at least one of the protrusions being capable of interlocking with at least one of the recesses to prevent movement between these contacting portions.
10
4. A conductor member as defined in claim 2 wherein the engaging means includes one element having a series of hooks and an adjacent or other element having a series of loops, the hooked element capable of interlocking with the looped element to inhibit movement between these contacting portions.
15
5. A conductor member as defined in claim 2 wherein the engaging means provides a releaseable bond between the contacting portions.
6. A conductor member as defined in claim 5 wherein the engaging means includes an adhesive applied to or forming part of the exposed surface and being capable of releaseably adhering to the conductor member or the other object to prevent relative movement therebetween.
20
7. A conductor member as defined in claim 3 wherein the protrusions and recesses of the engaging means include respective flutes and elongate channels each being arranged generally parallel to one another and coaxial with the conductor member.
- 25 8. A conductor member as defined in claim 7 wherein the protrusions and recesses are in cross section at least in part shaped complementary to one another to assist with their releaseable and interlocking engagement.

9. A conductor member as defined in claim 8 wherein the flutes and channels are circumferentially spaced and occupy substantially the entire circumference of the elongate member.
- 5 10. A conductor member as defined in any one of claims 7 to 9 wherein the flutes and channels are at least in part cross section tapered, flared or bulged outward to provide releaseable keyed engagement with each other.
11. A conductor member as defined in any one of claims 7 to 10 wherein the flutes are constructed of a resiliently flexible material to provide at least partial press fitting of the flute within the interengaging channel.
- 10 12. A conductor member as defined in any one of the preceding claims wherein the conductor member is contacted with itself whereby the engaging means reduce the likelihood of said member tangling or knotting with itself.
13. A conductor member as defined in any one of claims 1 to 11 wherein the other object is one or more other conductor members whereby contact and interengagement of the engaging means of said members at least lessens the likelihood of tangles or knots.
- 15 14. A conductor member as defined in any one of claims 1 to 11 wherein the other object is an attachment device including an exposed surface having other engaging means being adapted to contact the engaging means of the elongate conductor member for releaseable attachment of said conductor member to the attachment device.
- 20 15. A conductor member as defined in claim 14 wherein the other engaging means is at least in part shaped in cross section complementary to the engaging means of the conductor.
16. A conductor member as defined in either of claims 14 or 15 wherein the attachment device is adapted to be fixed or otherwise mounted to a building structure or furniture.
- 25 17. A conductor member as defined in any one of the preceding claims being in the form of an electrical cable or wire, or acoustical lead or wire.
18. A conductor tie being elongate and at or adjacent opposite ends designed to engage itself and at least one of a plurality of the conductor members according to any one of the preceding claims, said members being encircled by the conductor tie.

19. A conductor tie as defined in claim 18 being in the form of a flexible strip on each of its opposing surfaces having a plurality of protrusions separated by a plurality of recesses, one or more of the protrusions on one of the opposing surfaces being designed to releasably engage one or more of the recesses on an opposite of said surfaces.
- 5 20. A conductor tie as defined in claim 19 wherein the protrusion/recesses of the conductor tie are of a substantial identical cross-sectional shape to those of the conductor members to permit interengagement of the conductor tie and said members.

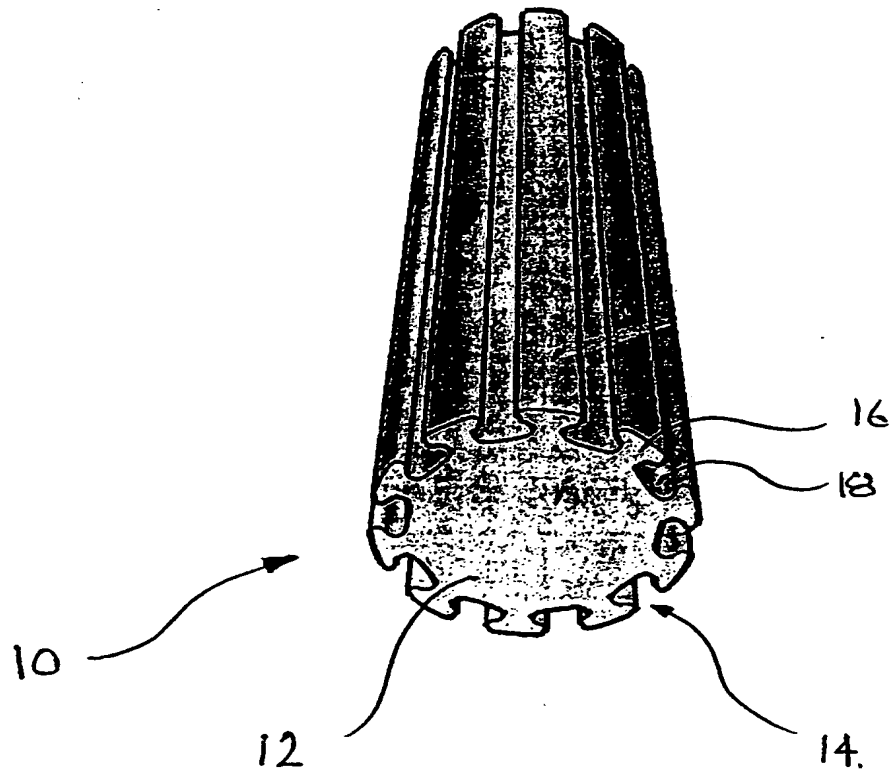


FIGURE 1

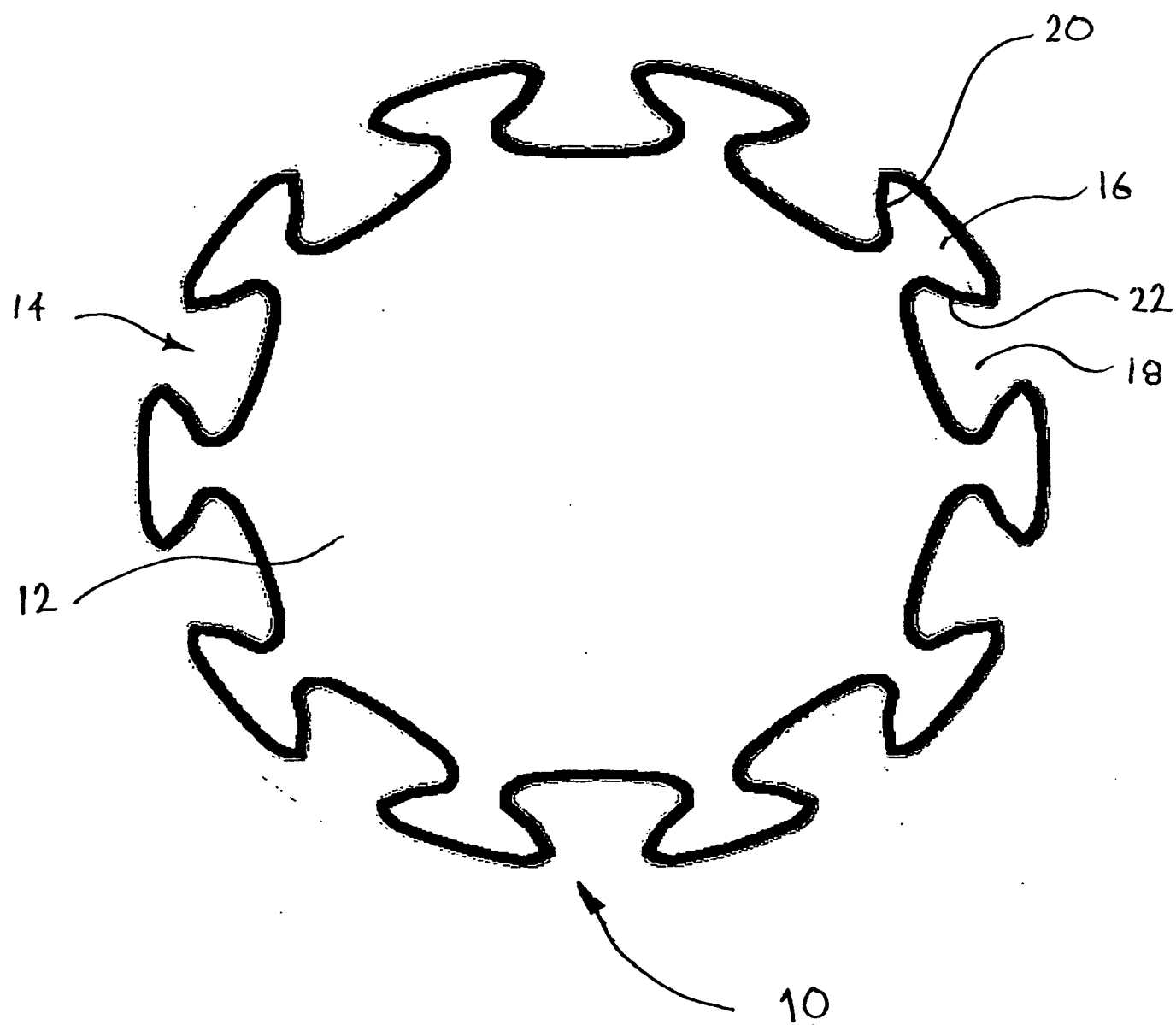


FIGURE 2

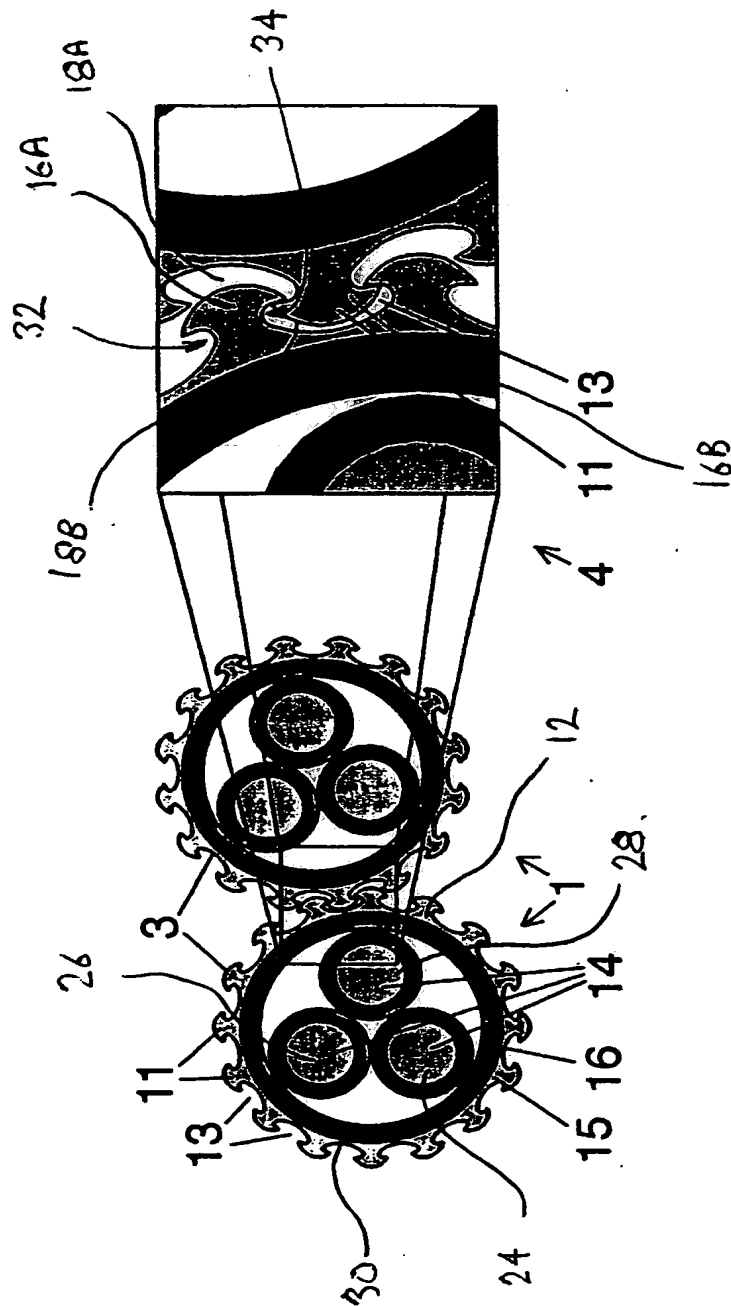


FIGURE 3

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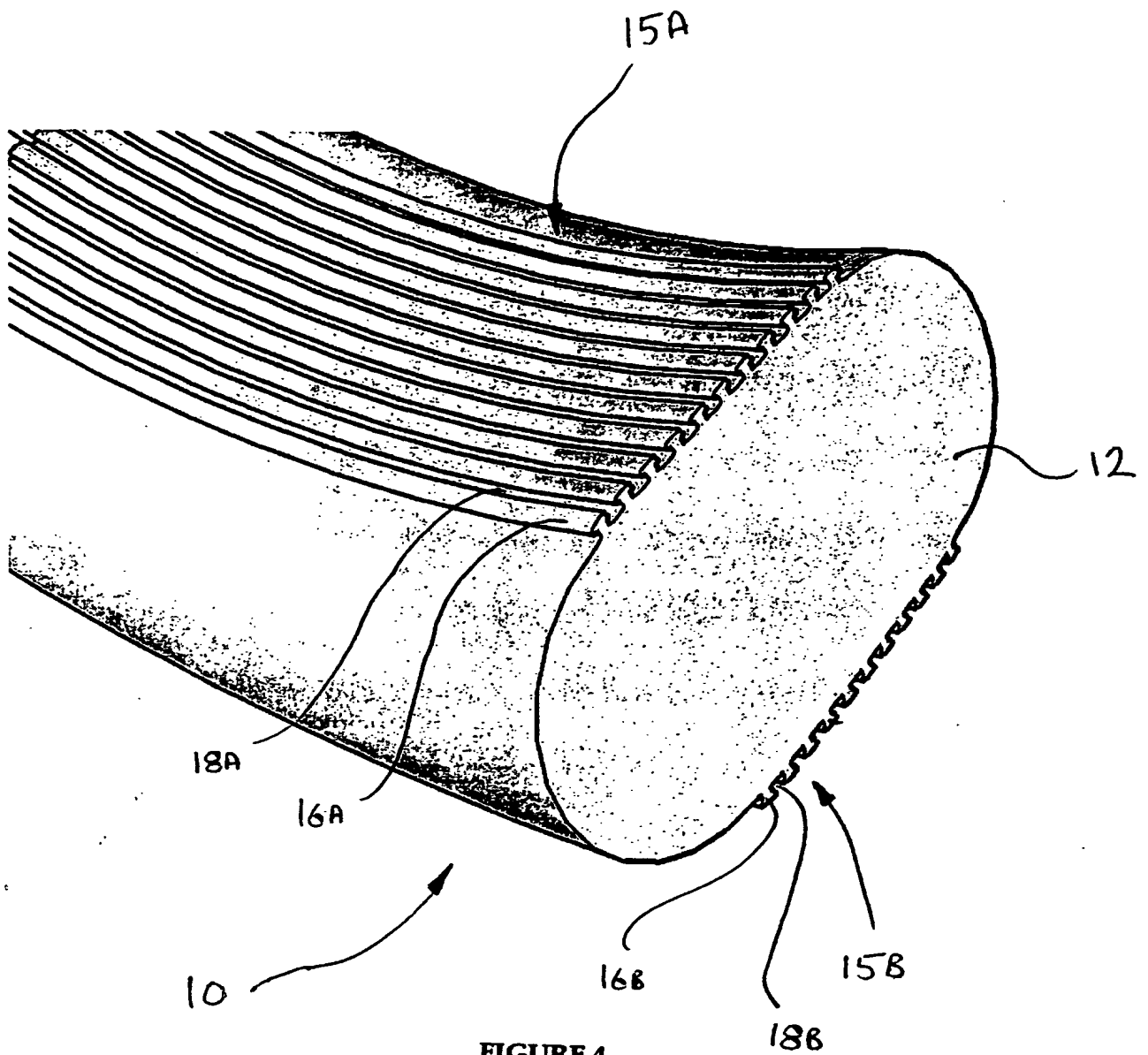


FIGURE 4

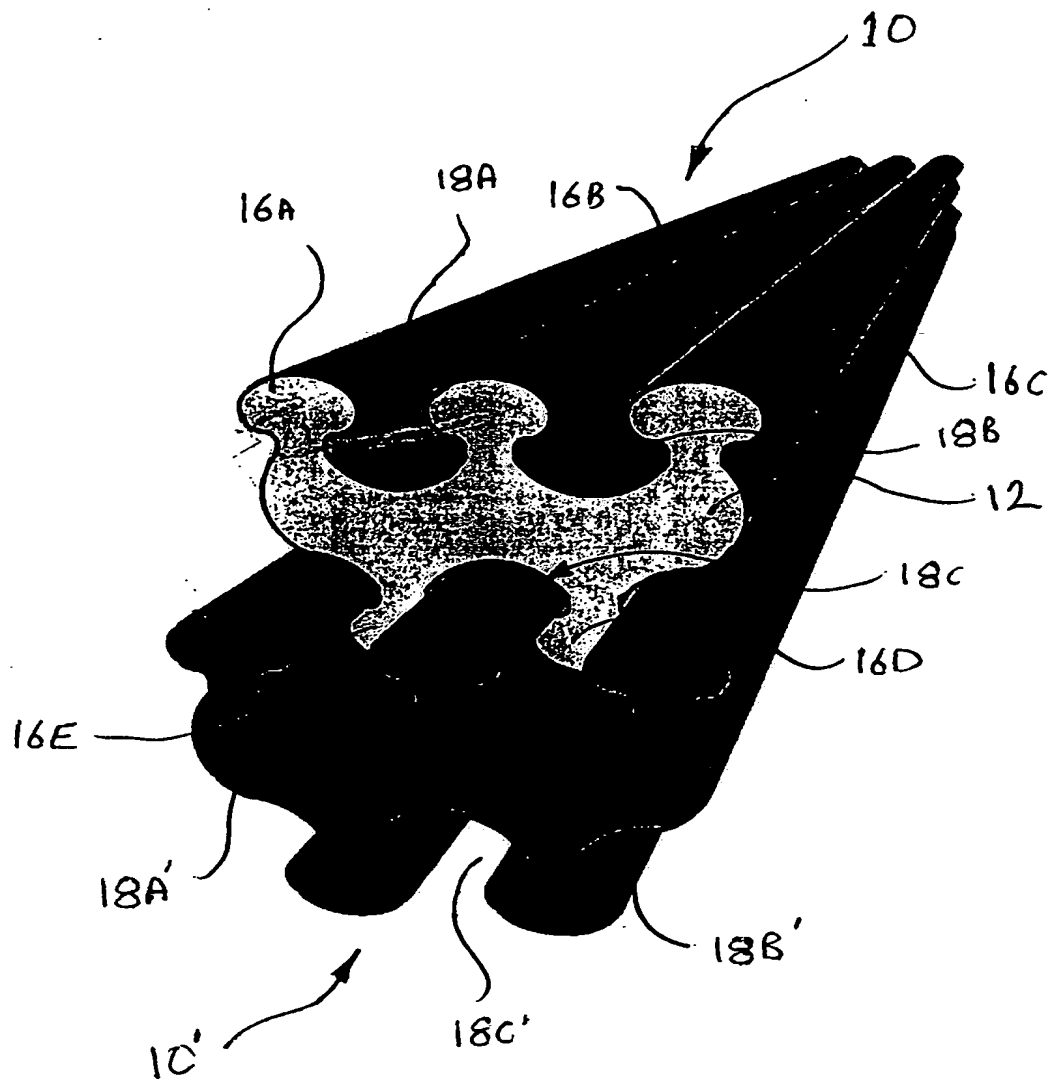


FIGURE 5

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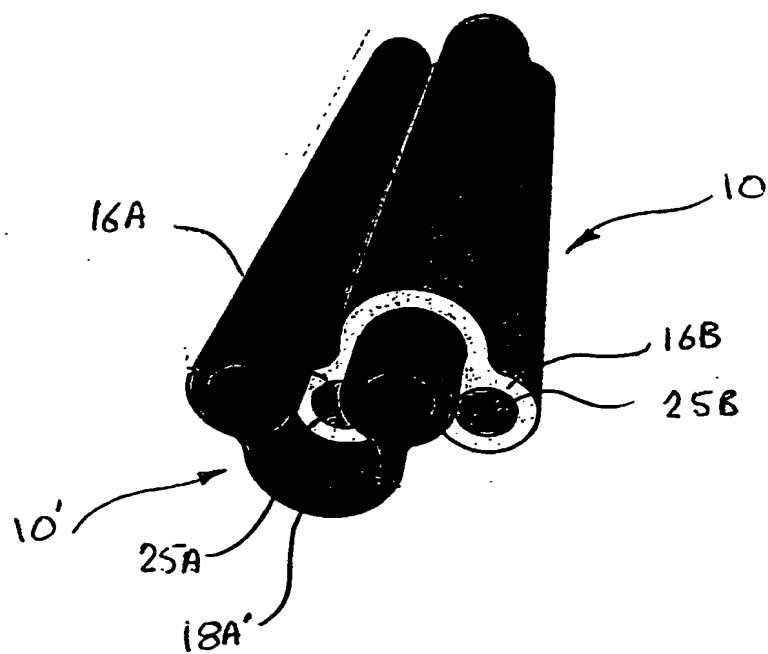


FIGURE 6

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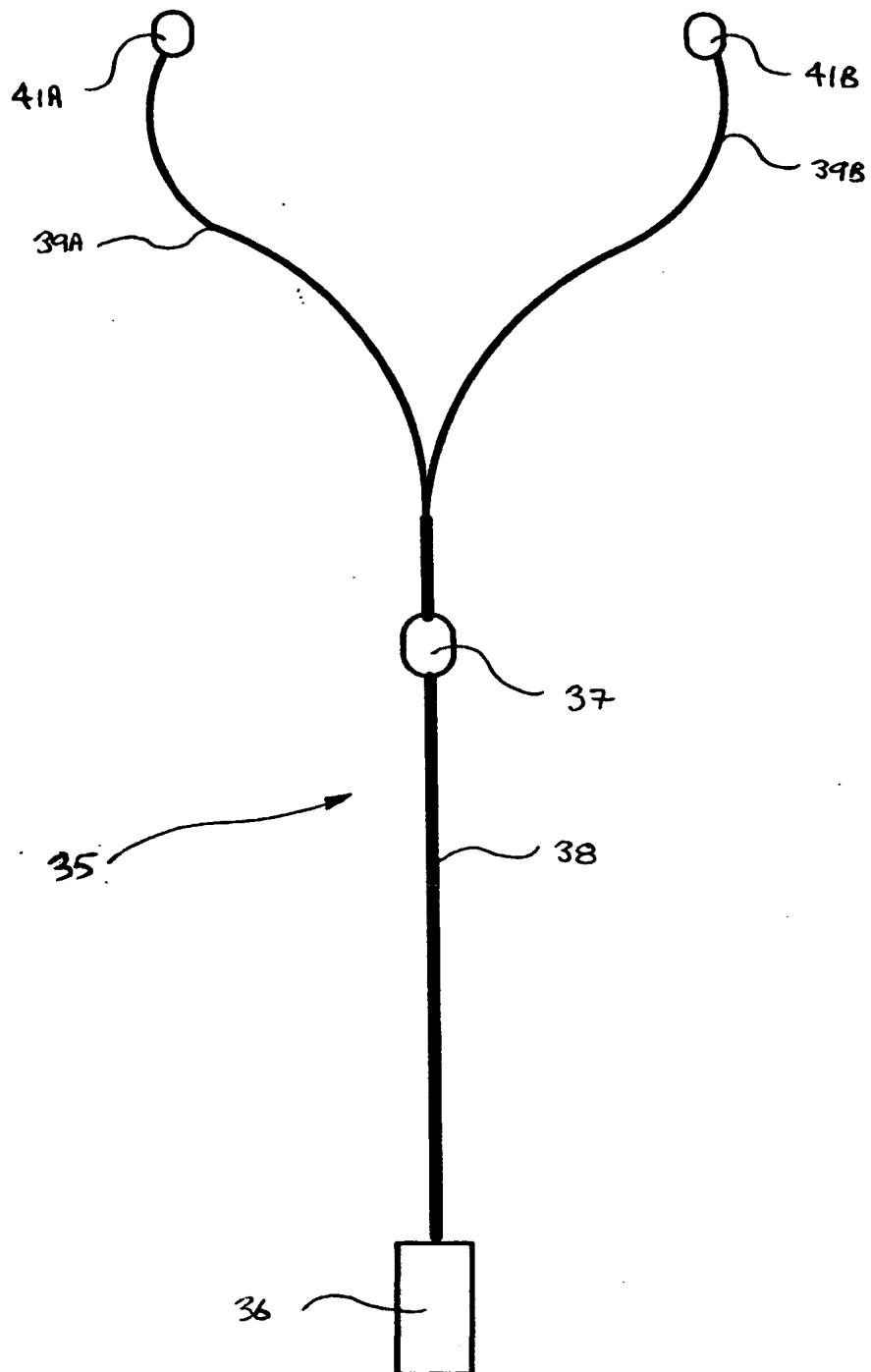


FIGURE 8

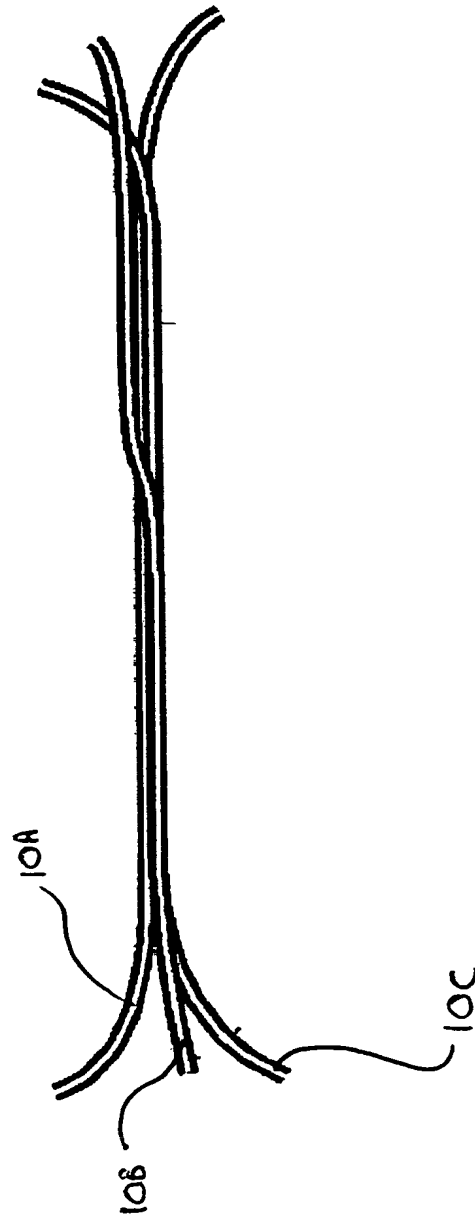


FIGURE 7

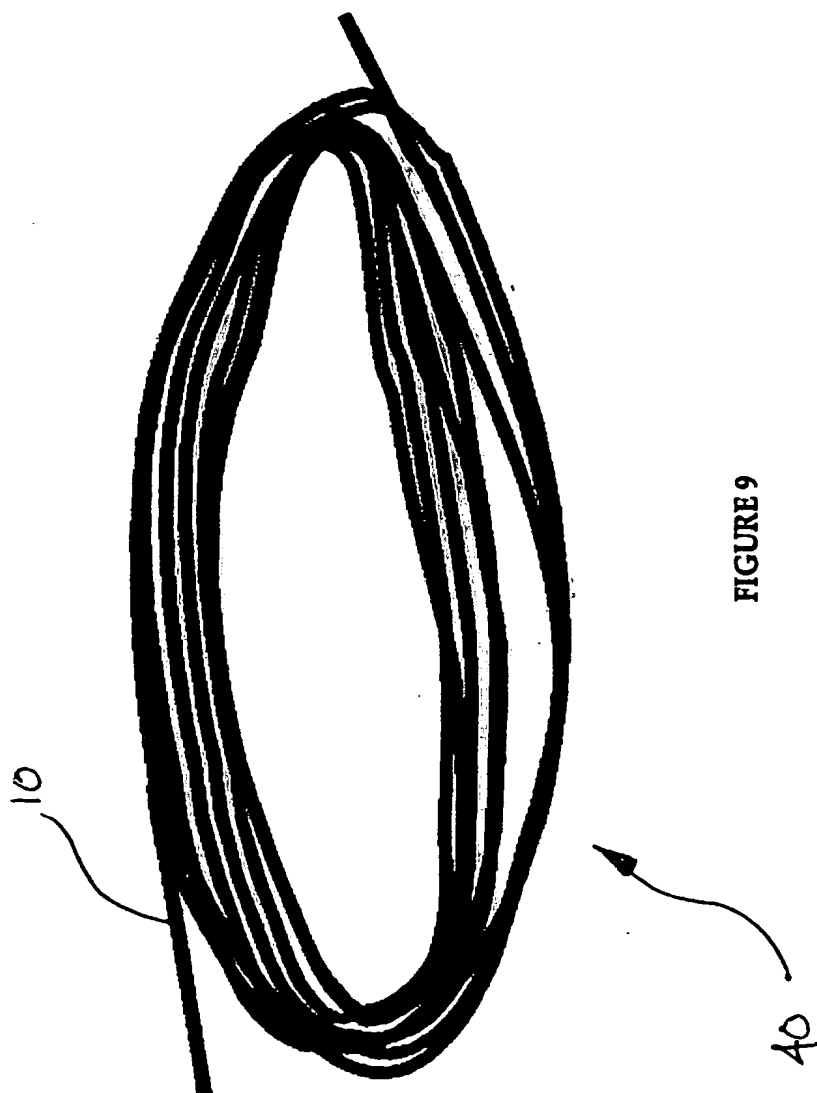


FIGURE 9

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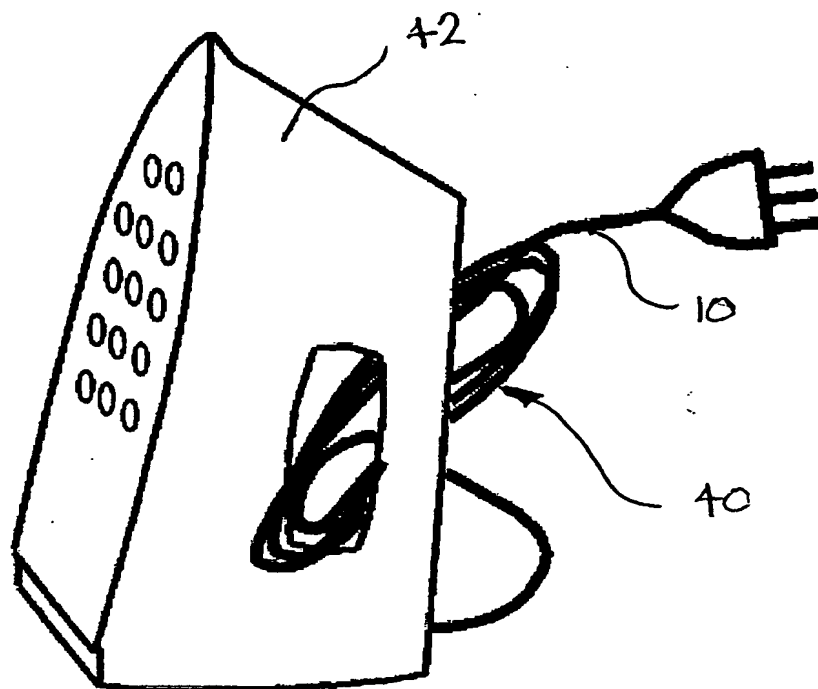


FIGURE 10

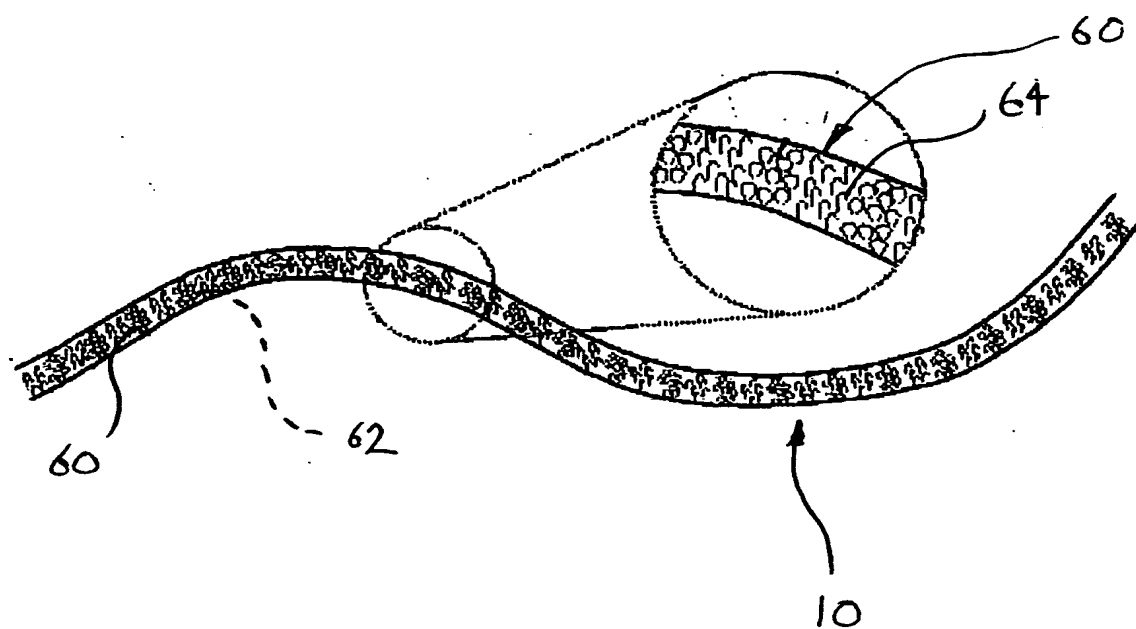


FIGURE 11

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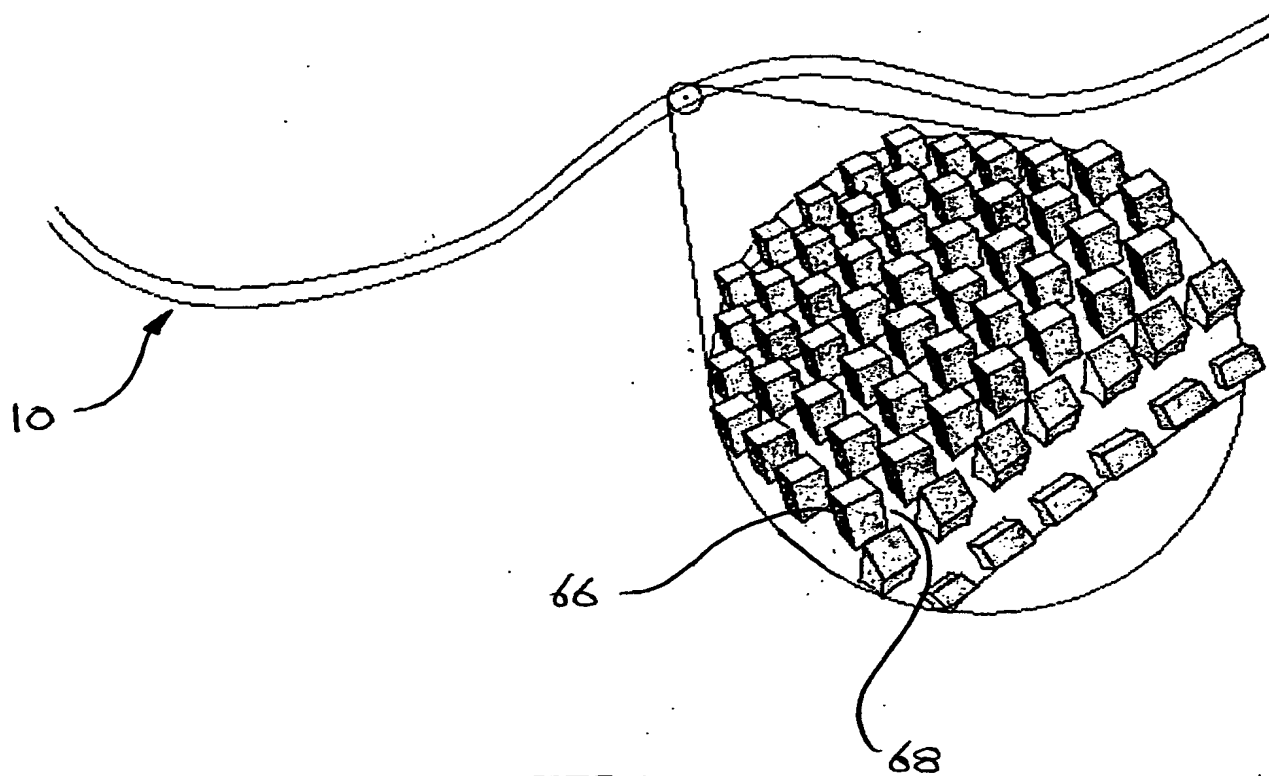


FIGURE 12

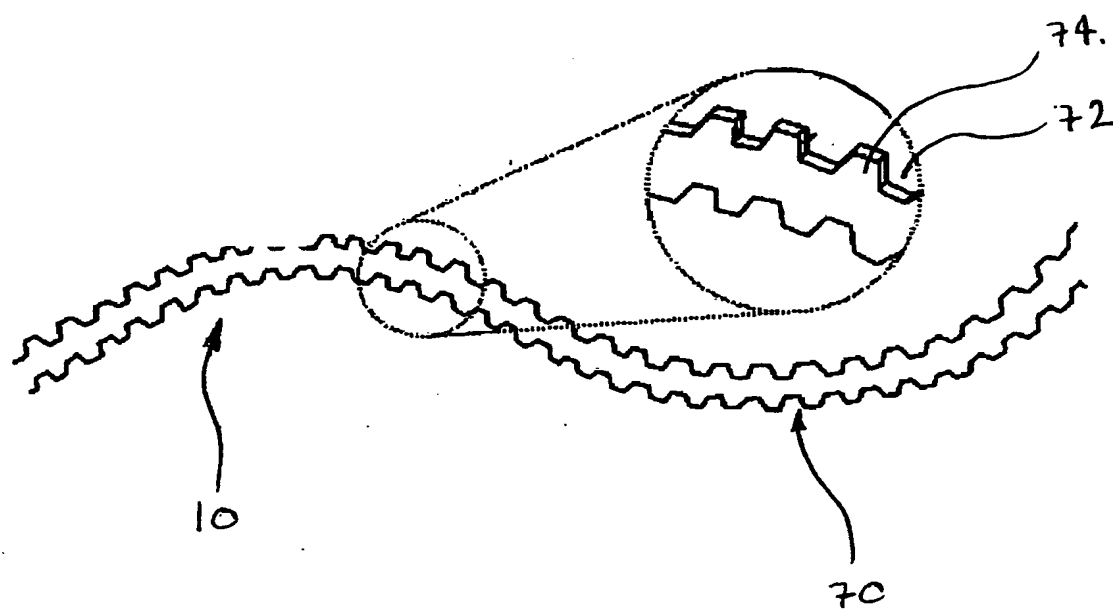


FIGURE 13

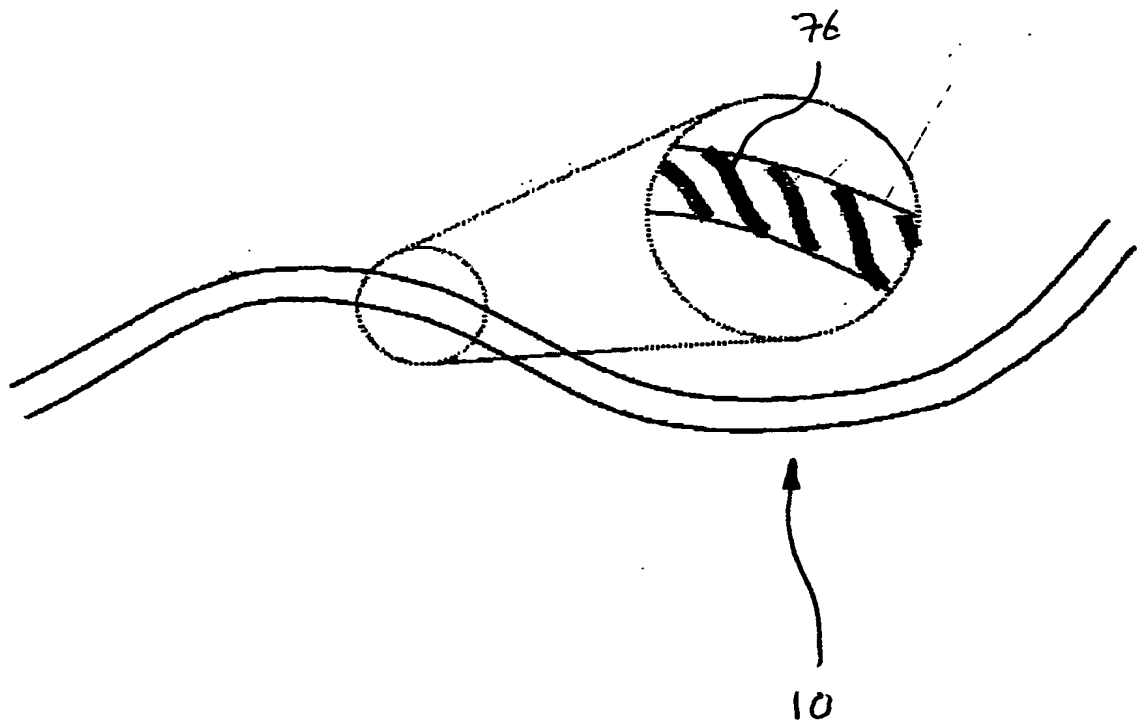


FIGURE 14

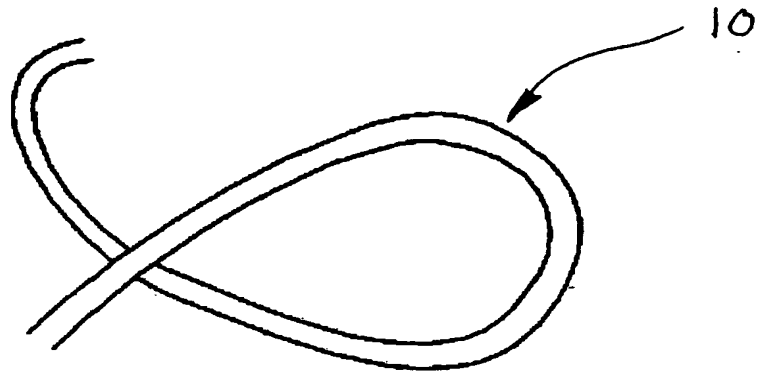


FIGURE 15

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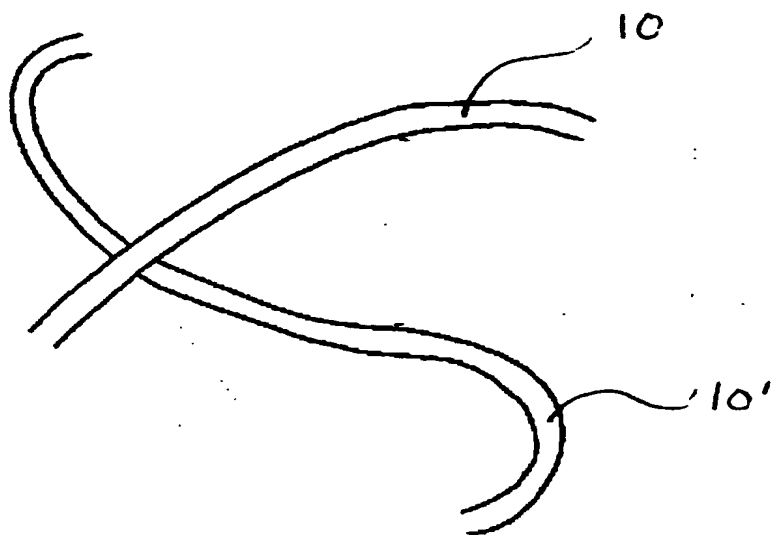


FIGURE 16

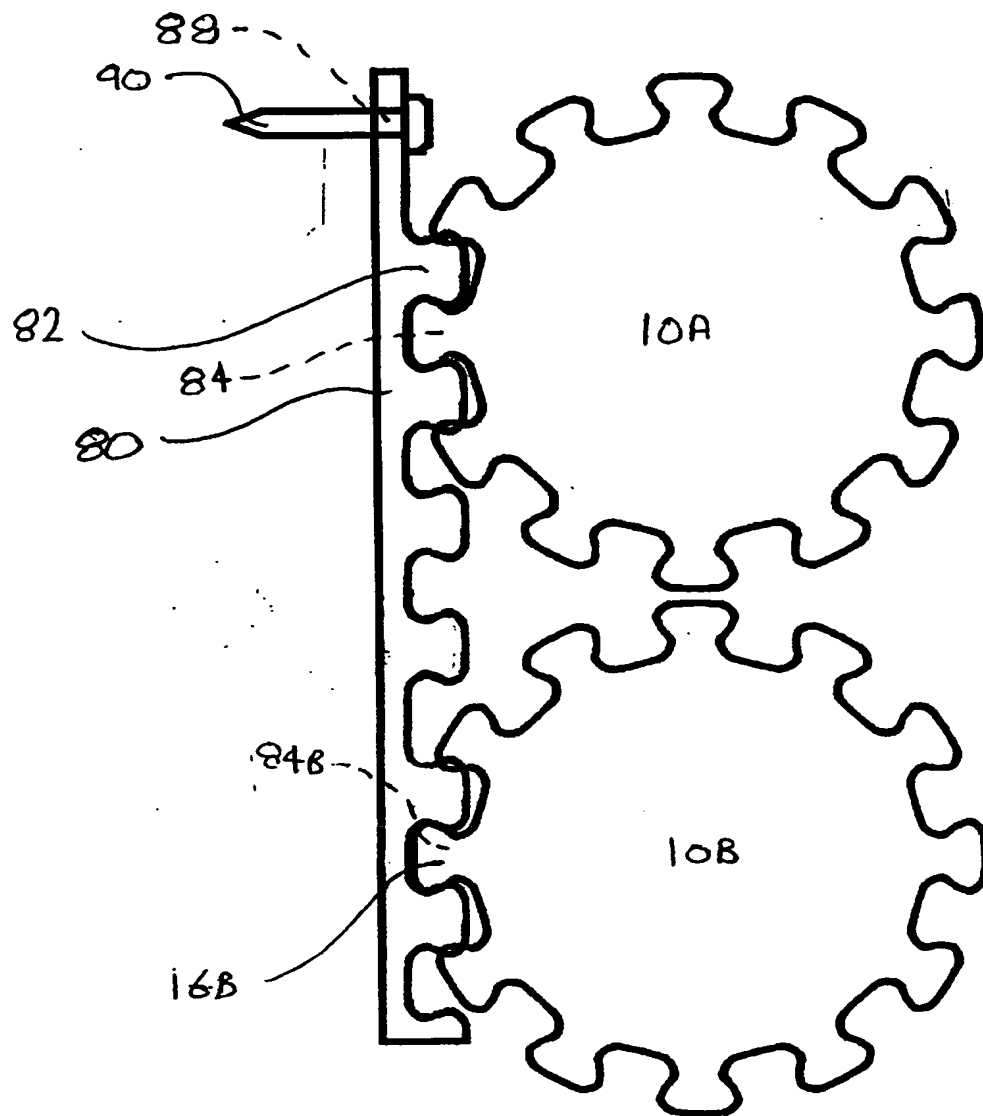


FIGURE 17

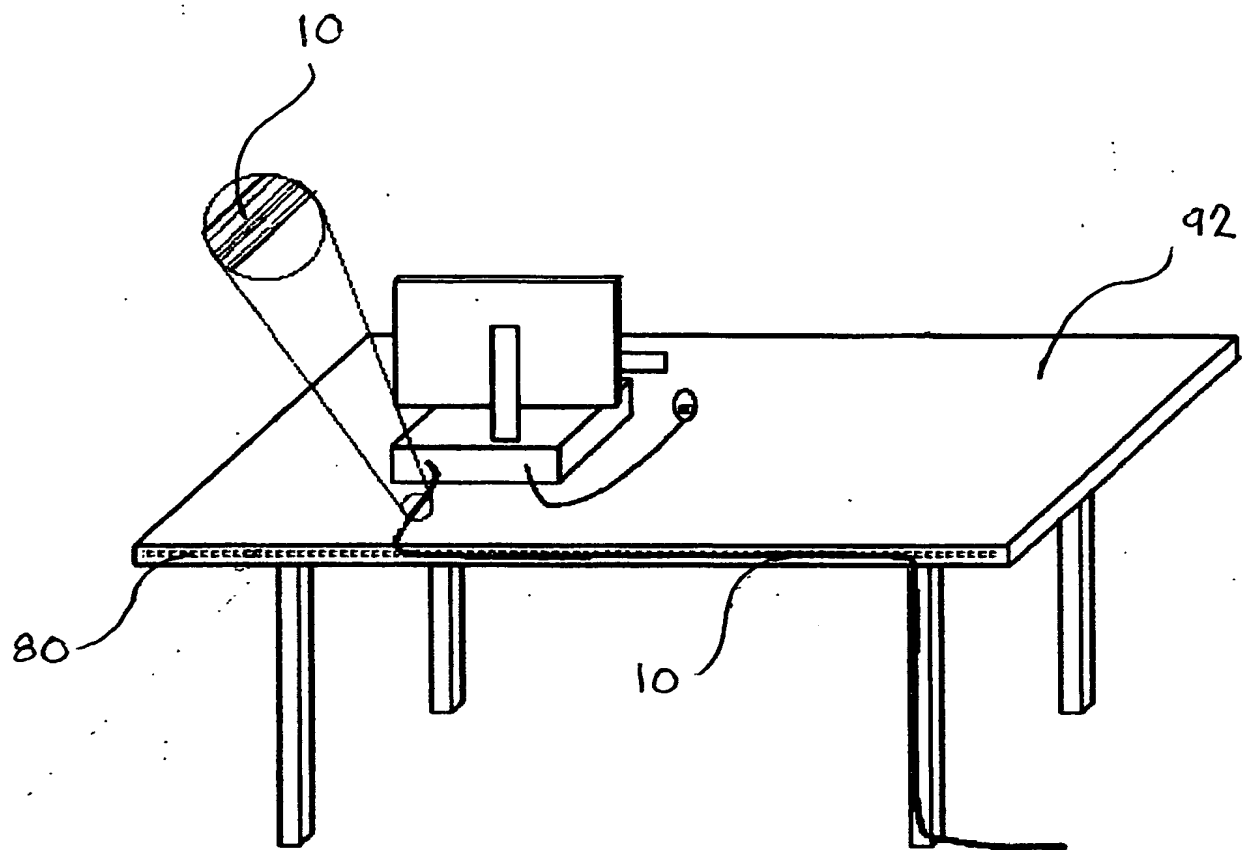
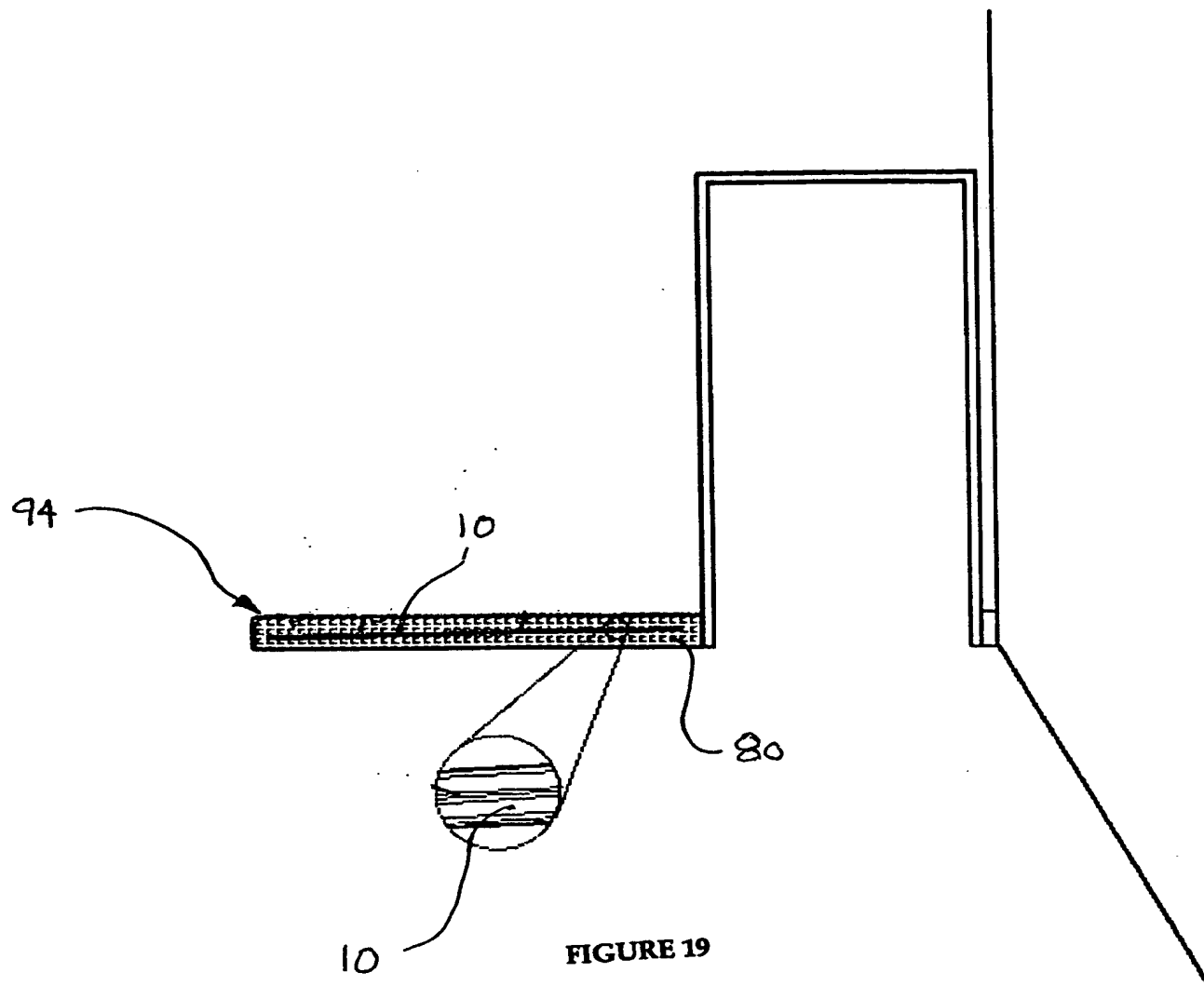


FIGURE 18



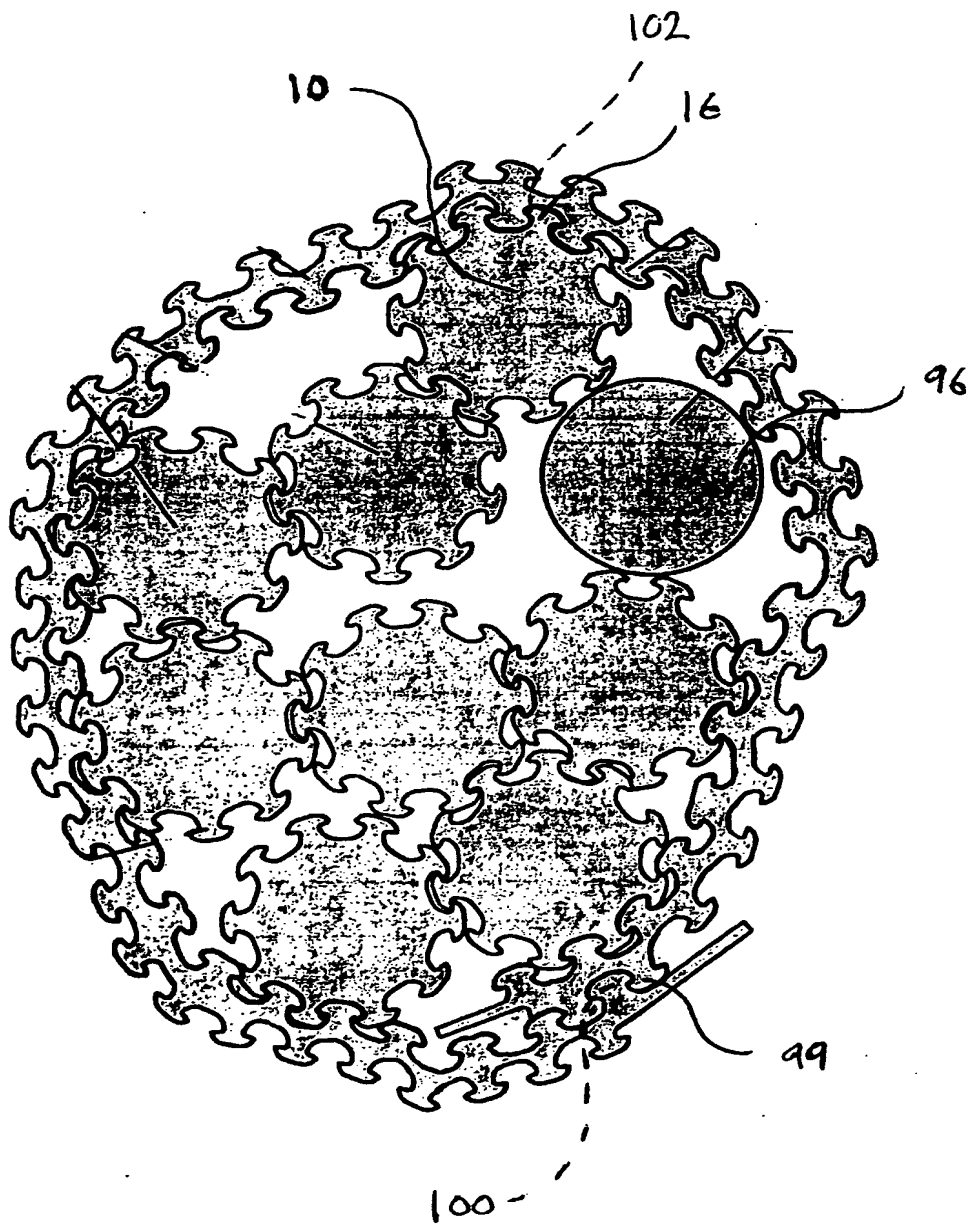


FIGURE 20

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2004/001145

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl. ⁷: H01B 7/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

DWPI: cord, cable, lead, wire, conductor, interlock, engage, channel, groove, release, attach, insulator, sheath and similar terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 961296 A1 (ALL-LINE INC (TW)), 1 December 1999 Entire document.	1 - 20
A	GB 2381651 A (METHODE ELECTRONICS INC.), 7 MAY 2003 Entire document.	1 - 20
A	WO 2003/009516 A2 (TARA LABS, INC.), 30 January 2003 Entire document.	1 - 20
A	US 6111202 A (MARTIN), 29 August 2000 Entire document.	1 - 20



Further documents are listed in the continuation of Box C



See patent family annex

* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
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Date of the actual completion of the international search

21 September 2004

Date of mailing of the international search report

5 OCT 2004

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU2004/001145

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member				
EP	0961296	NONE					
GB	2381651	DE	10058754	FR	2802015	GB	2325779
		GB	2356970	GB	2362751	GB	2381650
		JP	2001216849	KR	2000005215	US	6026563
		US	6222131	US	2003196828	WO	9737360
WO	03009516	US	2003017742				
US	6111202	NONE					
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.							
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